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Set-Based Design of Verification Strategies

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SET-BASED DESIGN OF VERIFICATION STRATEGIES

2019 Acquisition Research Symposium

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VIRGINIA TECHTM

What is the HARDEST thing engineers do?

James A. Ayers
Ferdinand C. Manock
Daniel Kottke
Bury Carl
D. L. Cannon
D. L. Cannon

Charles J. Wymore

Bill Atkinson
Vick Millidge

Bruce Horn
George Gaud
Rod Holt

Andy Hertzfeld
Angeline Lo

James A. Horn
HAP HORN
E. D. D.

W. E. McCammon
Burrill Smith
Jef Raskin

Langhill
Ragor Alejo

Percy Sharp
Steven Jobs

Chris Robertson

Joan MacL

Larry Kenyon
Martin P. Haller
Calotte Oakland

Larry Jidel
Chris Kenyon
Mike Boich

Lynn Sakahachi
Benjamin L. Fung

Bill Fernandez
Donna Demman
Patti King

David H. Reed

Ronald W. Nicholson

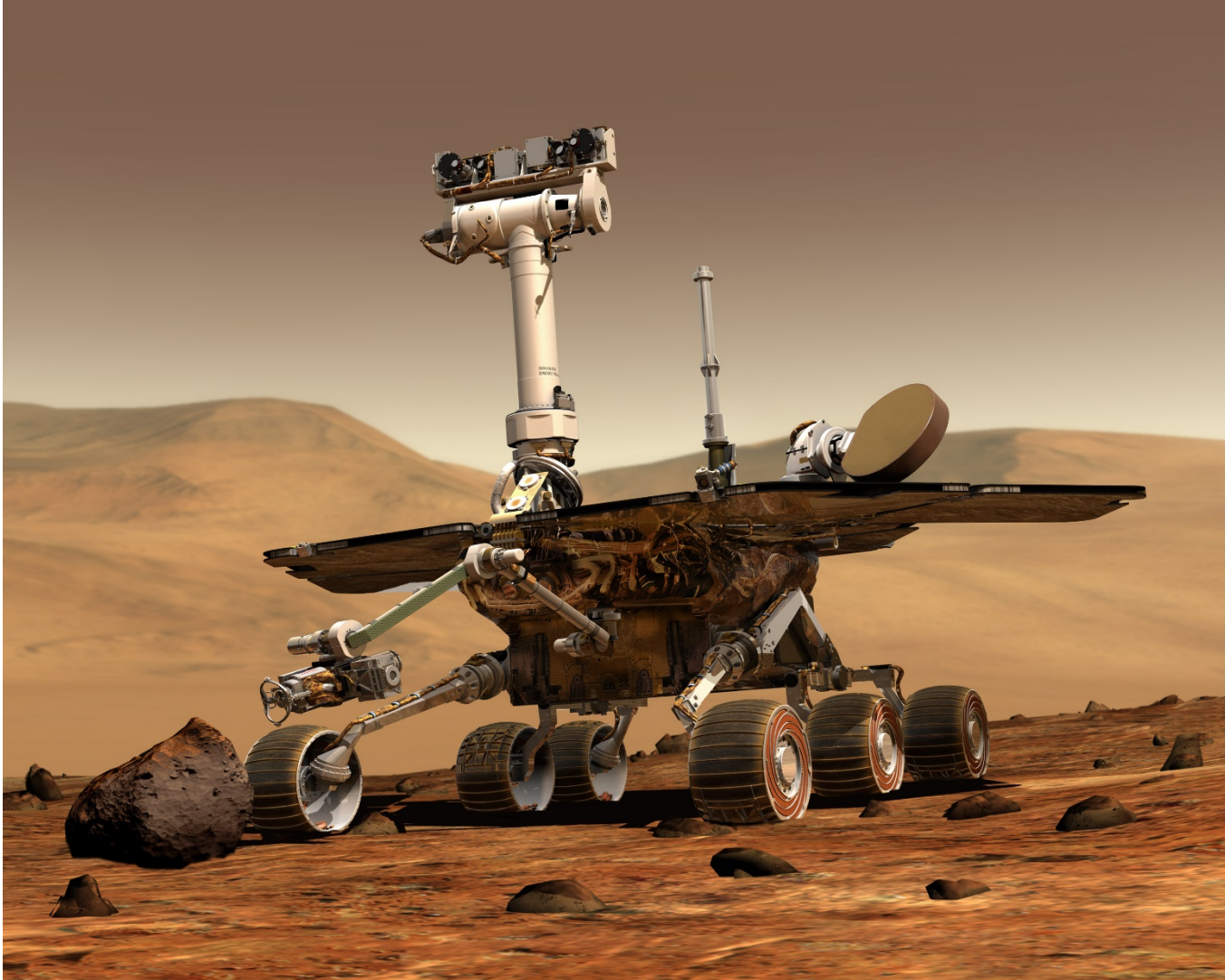
Matt Carter
Robert L. Bellville

W. J. J.

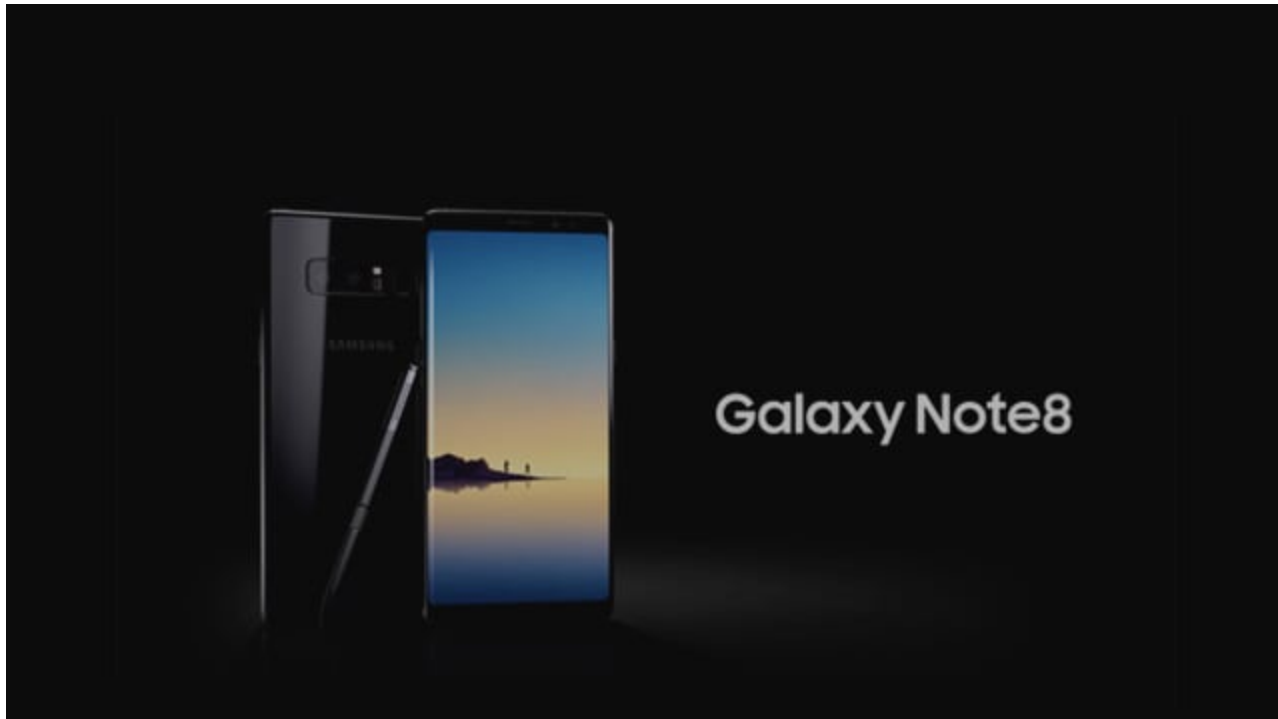
Randy Wigginton

Sandra Wilkins
Michael Munnay

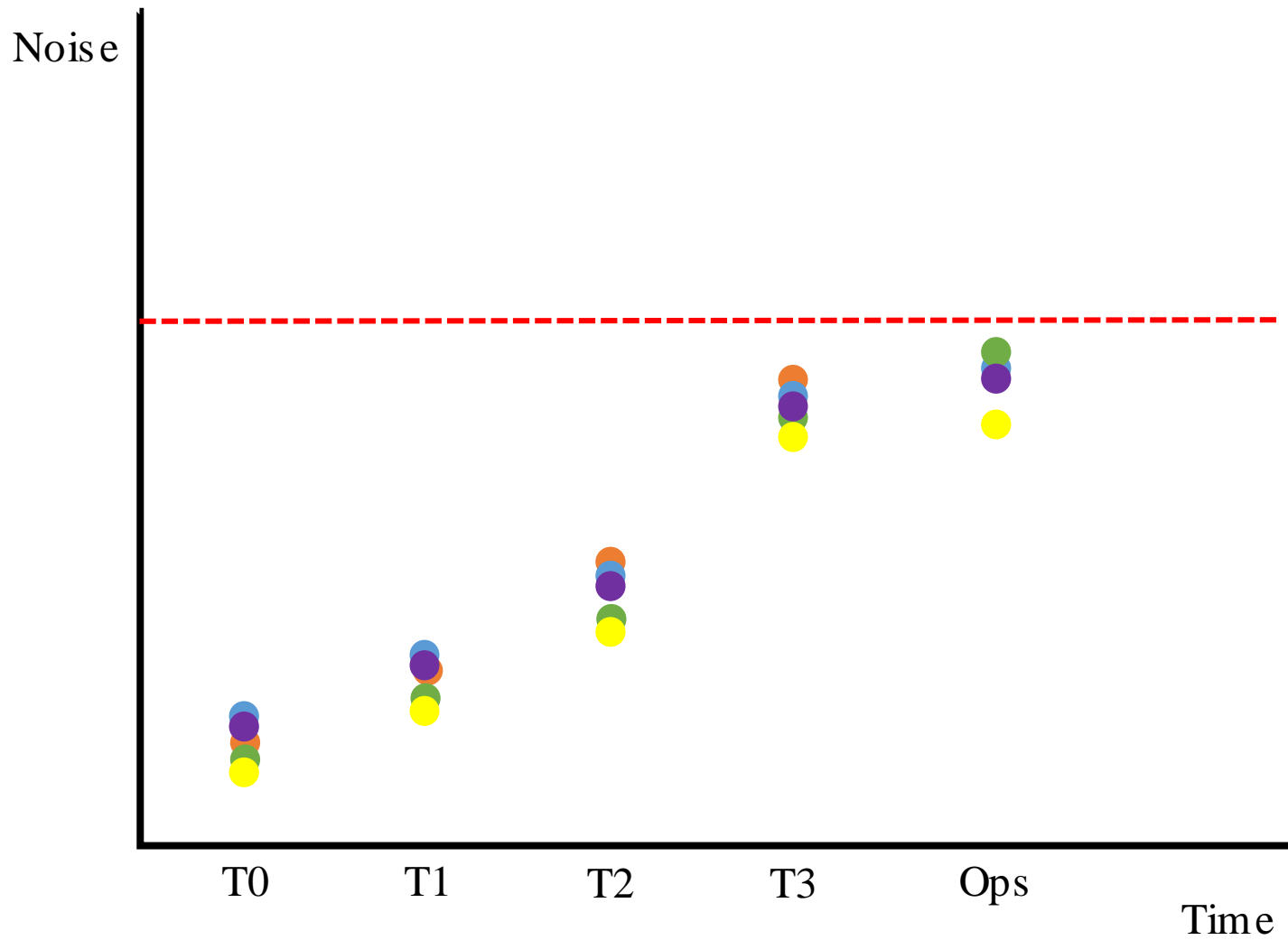
FEBRUARY 10, 1982

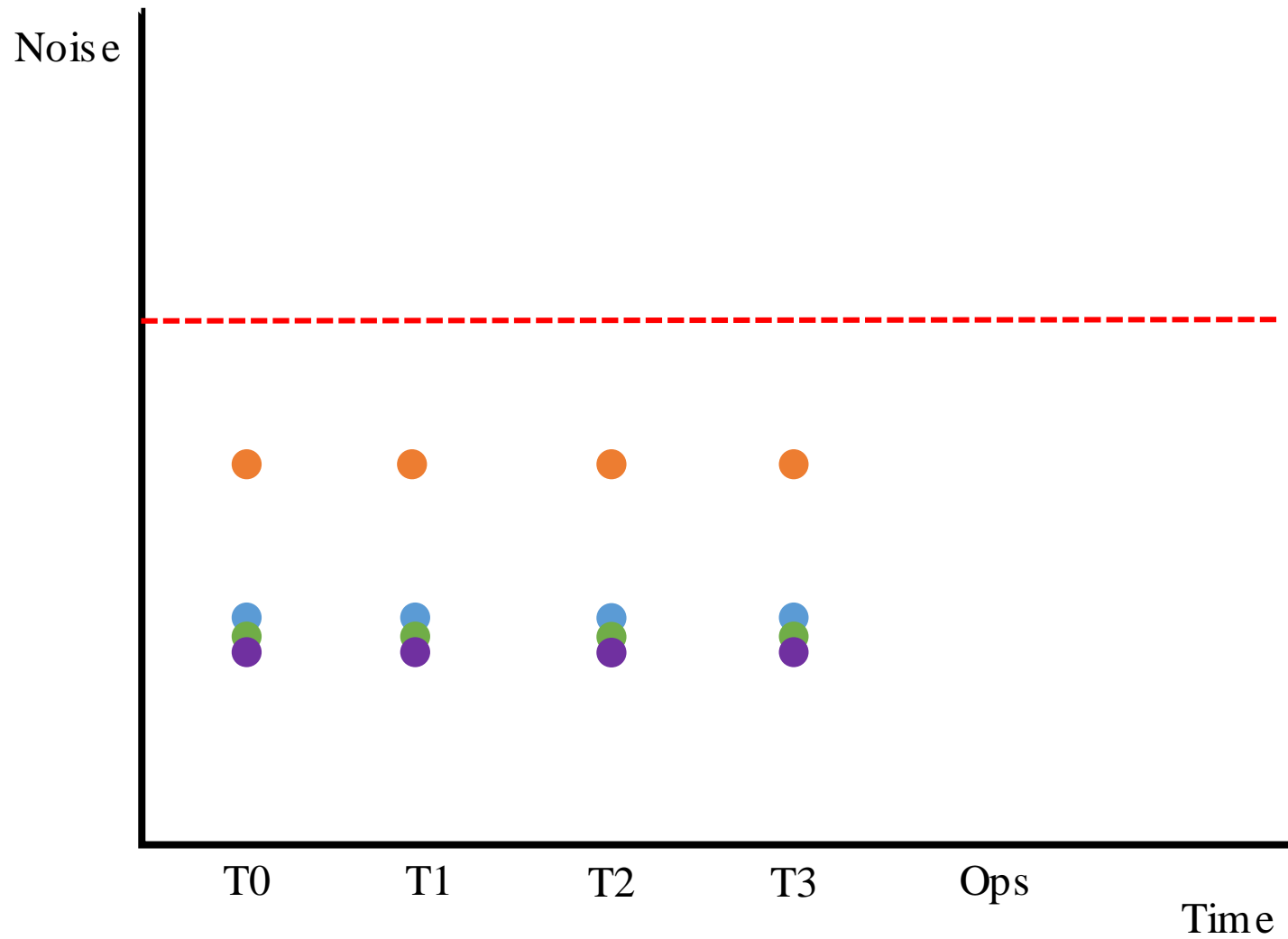


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A verification activity is objective.
The confidence we gain is not.

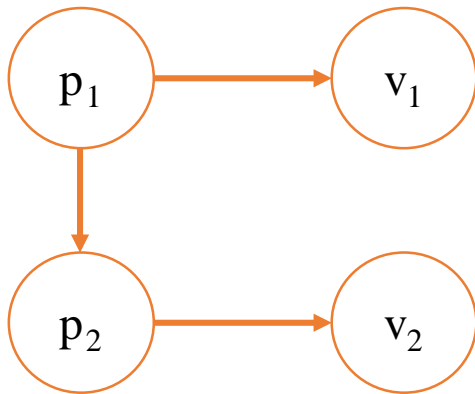
Verification is not objective.
Verification is an **agreement**.

p_1 : physical properties of model

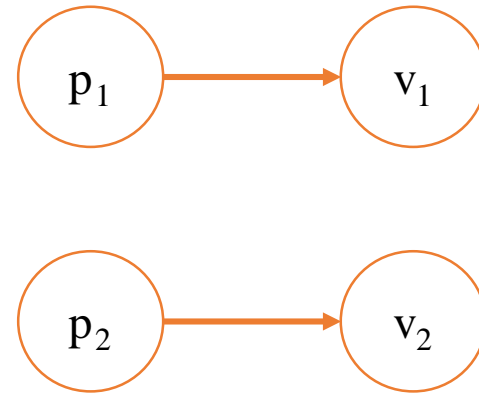
p_2 : mass of final product

v_1 : estimated mass with model

v_2 : measured mass of final product

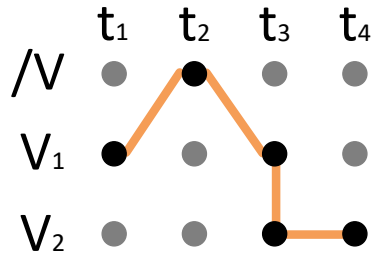


$$P(p_2 | v_1) \neq P(p_2)$$



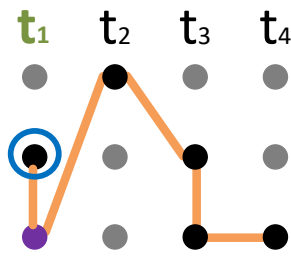
$$P(p_2 | v_1, v_2) = P(p_2 | v_2)$$

Current paradigm



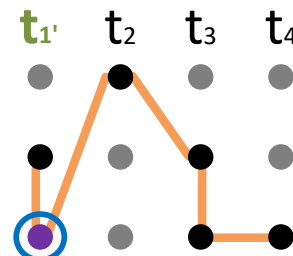
This is the **optimal** strategy, agreed upon contractual signature.

$$C_{\text{original}} = \sum C_{\text{black dots}}$$



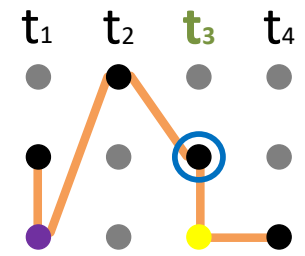
Circled activity showed **low margin**. Unplanned purple activity needs to be added through **CR**.

$$C_{\text{final}} = C_{\text{original}} + \Delta_{\text{purple}}$$



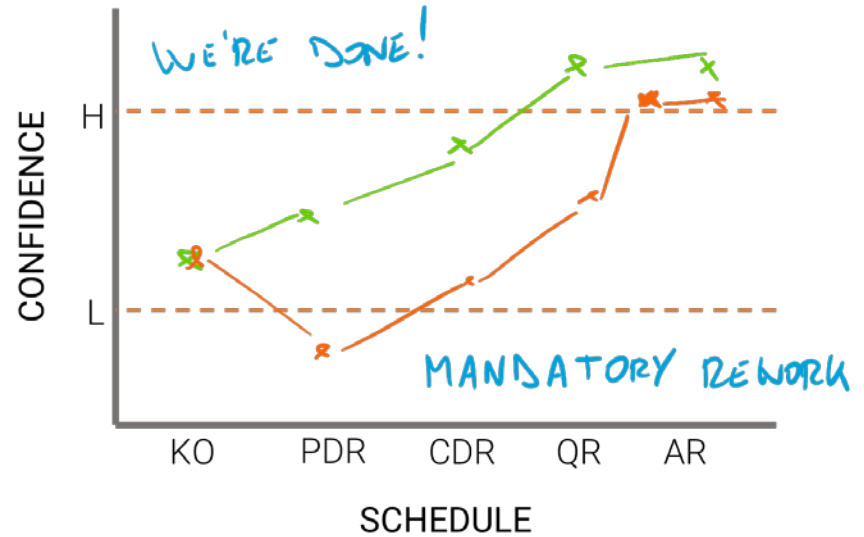
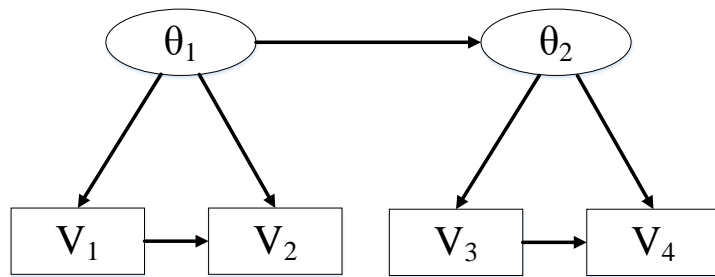
Circled activity showed **nominal margin**. No change to strategy.

$$C_{\text{final}} = C_{\text{original}} + \Delta_{\text{purple}}$$



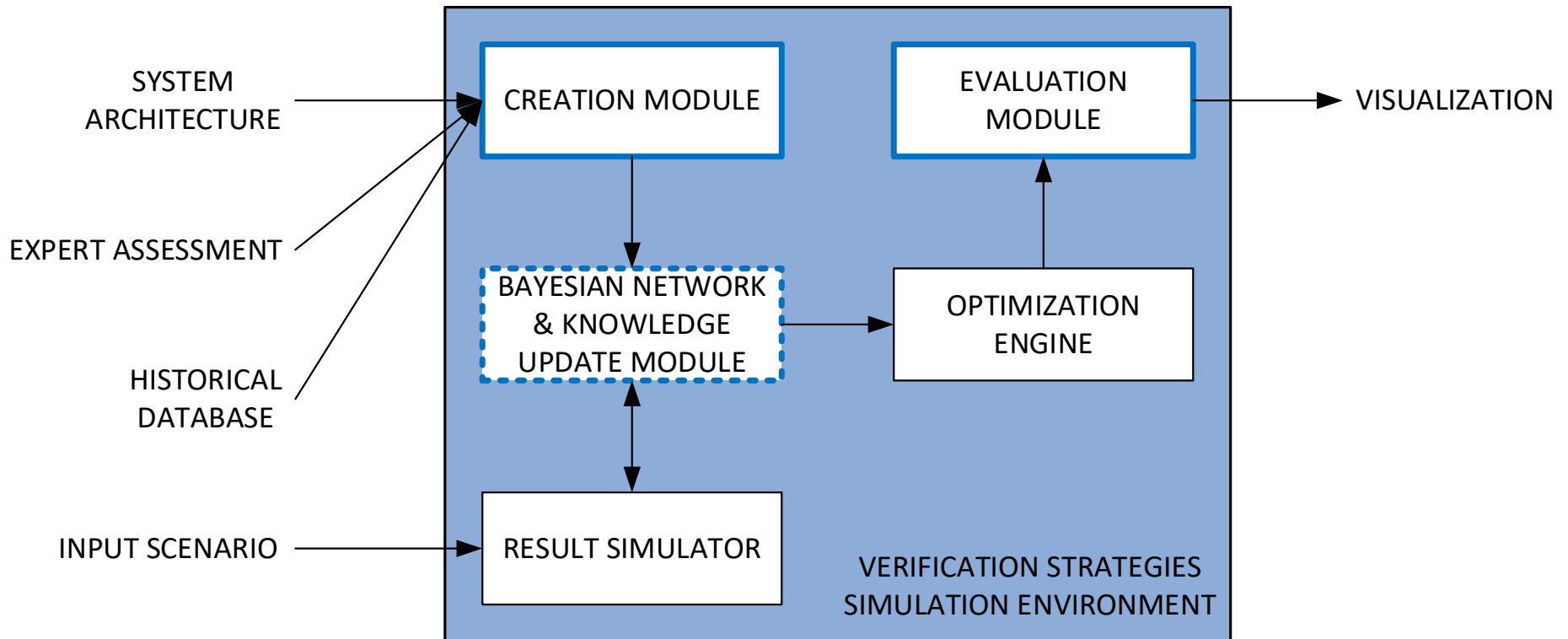
Circled activity showed **ample margin**. Yellow activity provides no value, but it is executed.

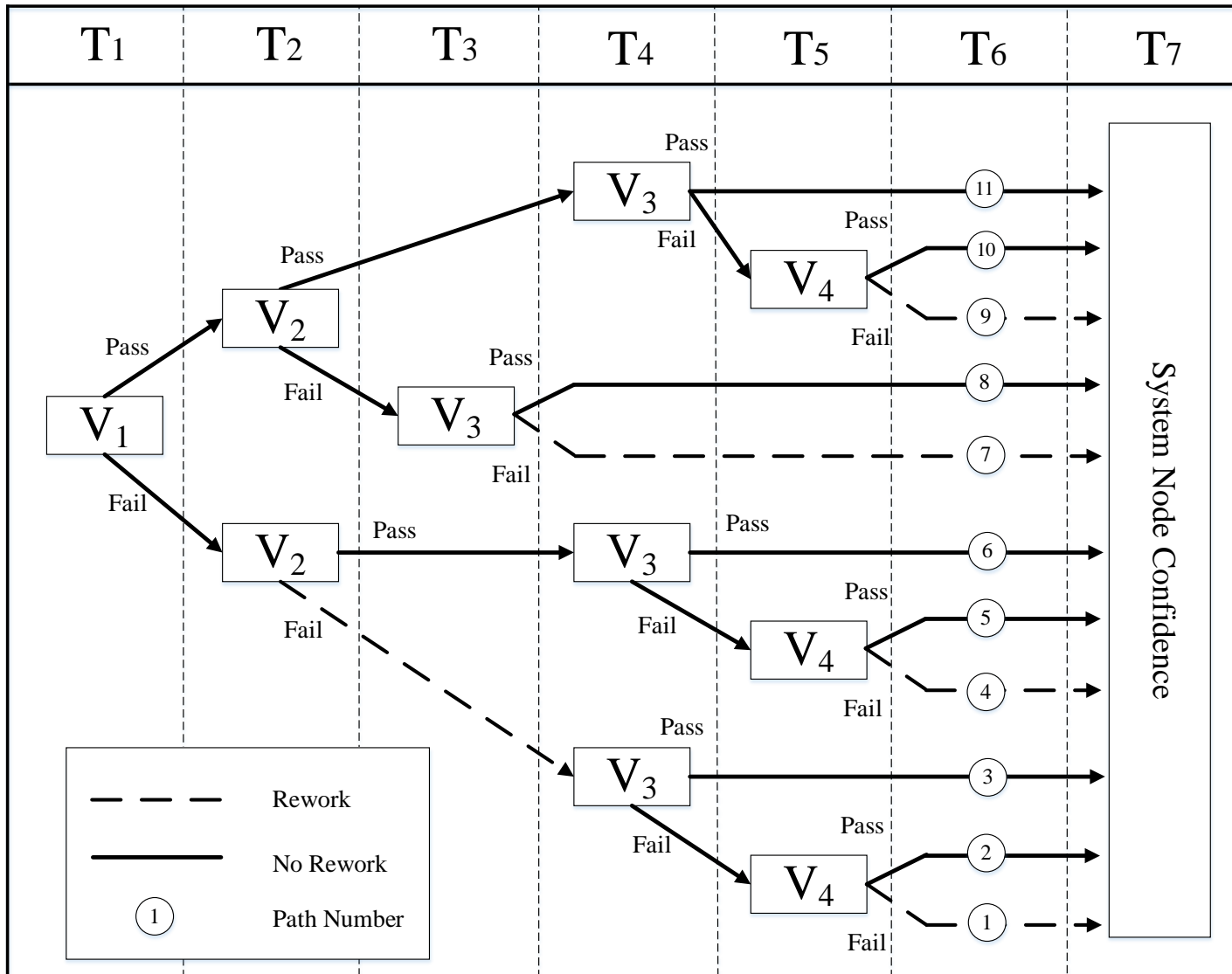
$$C_{\text{final}} = C_{\text{original}} + \Delta_{\text{purple}}$$

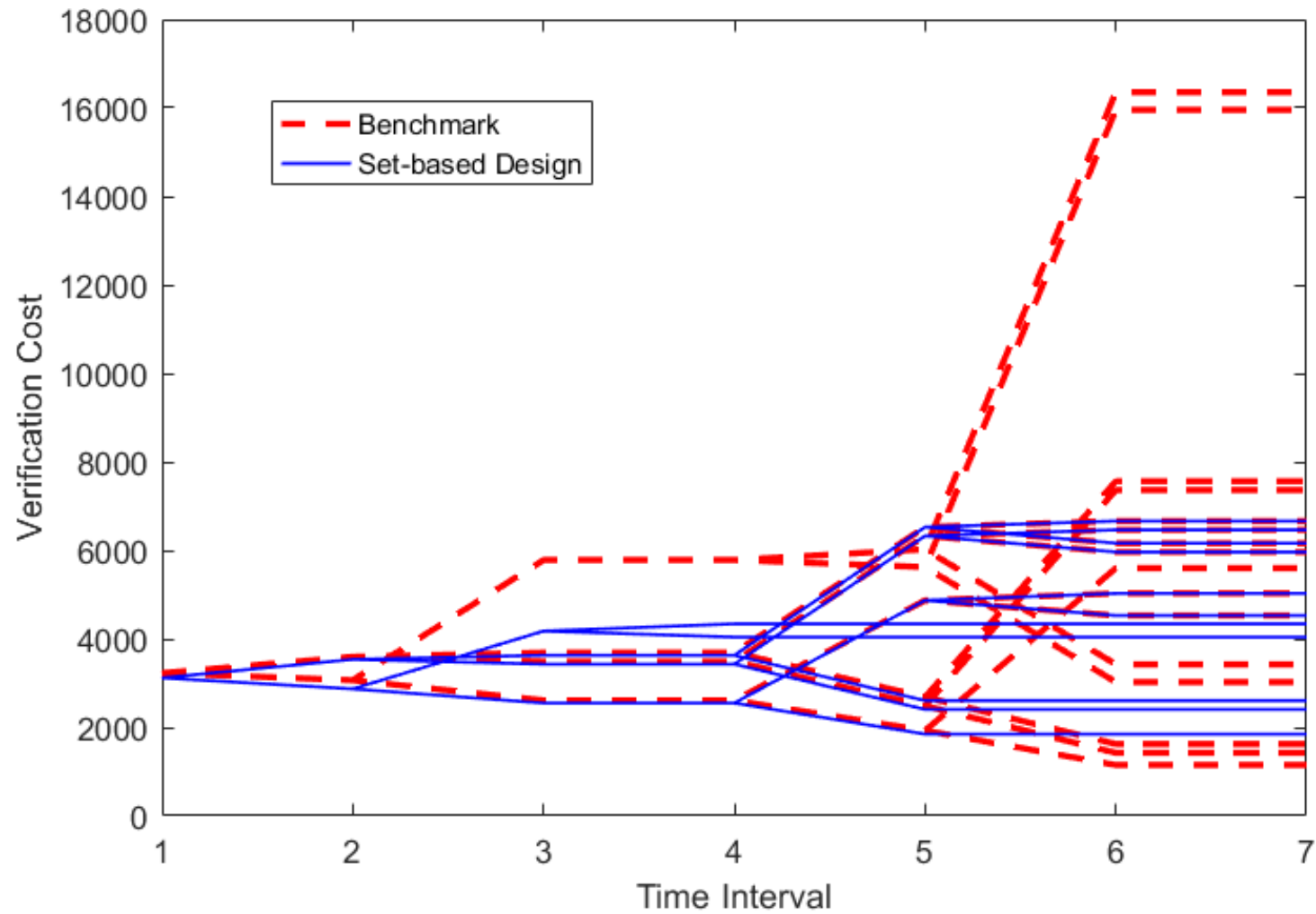


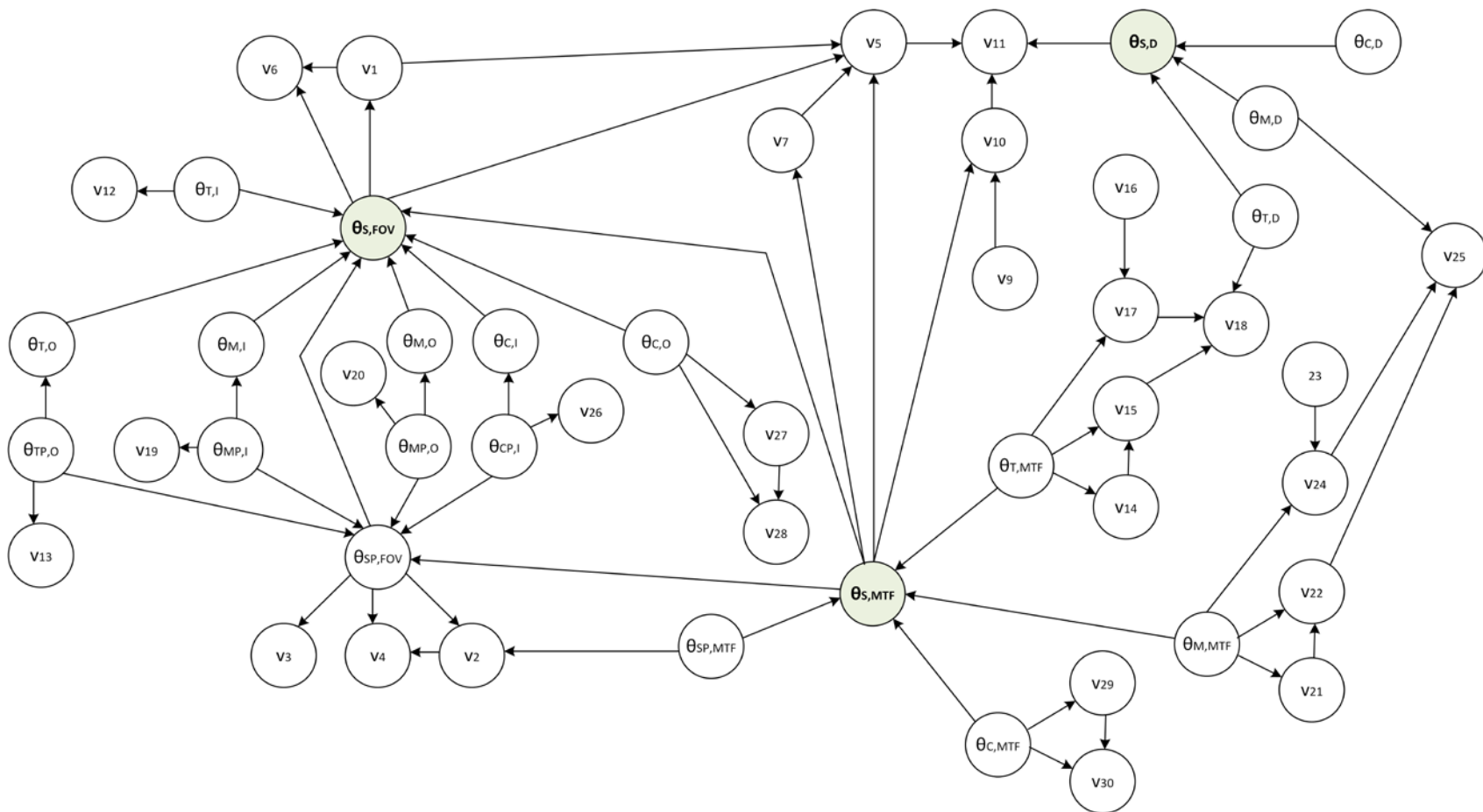
$$E[C_T(S)] = \sum_{V \in \mathbf{V}} C_V(V) + \sum_{k=1}^o \sum_{j=1}^n \sum_{v \in L(T_j)} P(v) P(\theta_{jk} | v) \delta(\theta_{jk} | v) C_R(\theta_{jk}) + \sum_{k=1}^o \sum_{v \in \mathbf{V}^*} P(v) P(\theta_k = e | v) C_I(\theta_k = e)$$

- STEP 1** Determine optimal verification strategy at Time 1.
- STEP 2** Choose first (timewise) verification activity (or subset of verification activities).
- STEP 3** Execute activity and update Bayesian network.
- STEP 4** Determine optimal remaining verification strategy and return to Step 2.

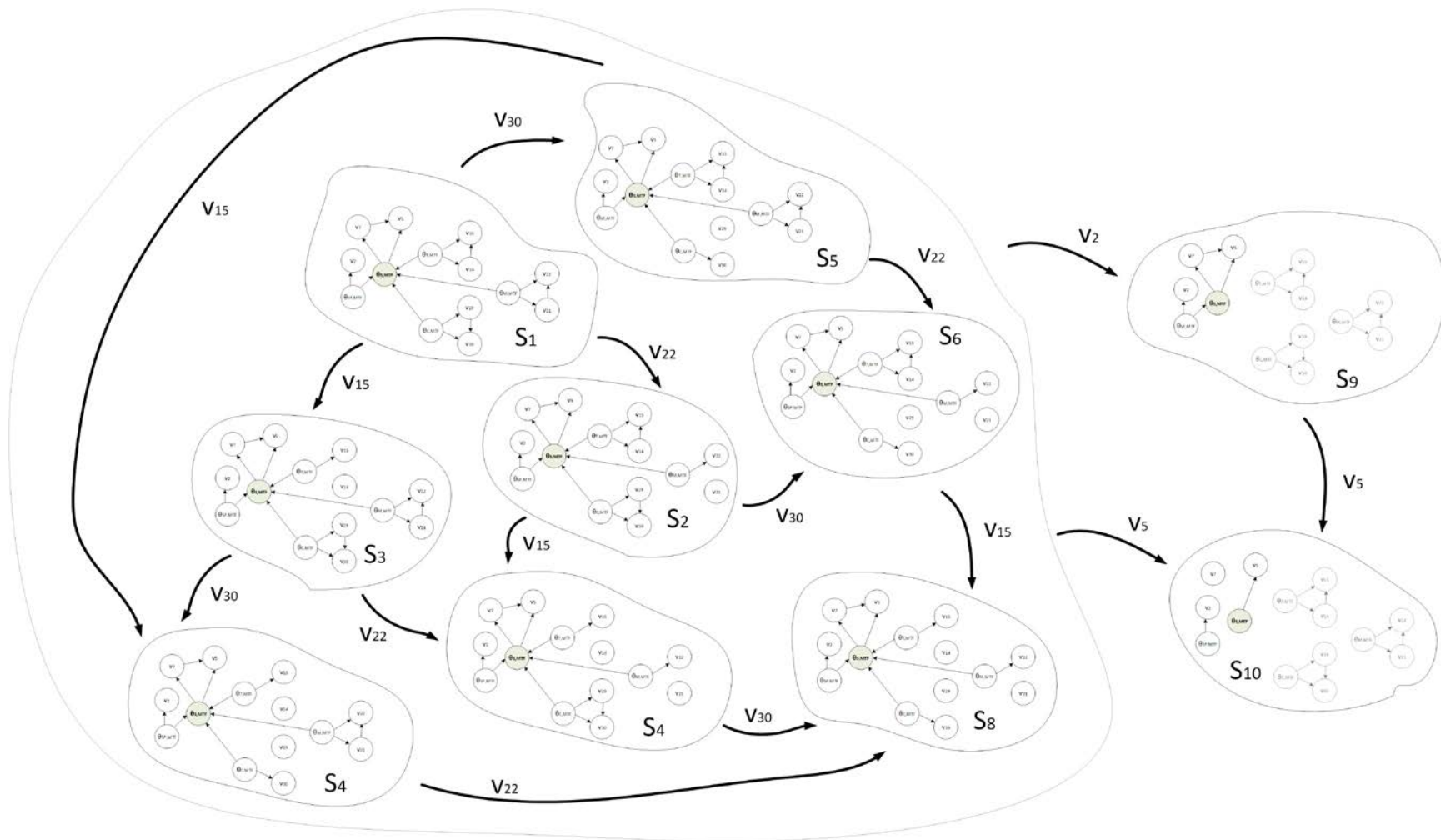








Currently working on this...



Planning to work on this...

WRAPPINGUP

CONTRACTING
verification activities must be

Dynamic

Adjusted after results

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